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Comparison of cooking energy consumption in rural areas in Nigeria (case study: Moniya, Alabata and odundun villages in Ibadan, Oyo state)

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Abstract
A survey was carried out to determine the cooking energy consumption patterns in Moniya, Alabata and Odundun communities in Akinyele local government area of Oyo state. Data was obtained from two hundred (200) households in each community using well-structured questionnaires. Analysis of the data revealed that kerosene and electricity are the most used energy sources in the three communities. The average cost per month of gas is the highest while that of saw dust is the lowest among the energy sources. The daily supply of kerosene and wood in the three communities is constant while that of electricity is the poorest. It was recommended, among other things, that the use of wood, charcoal and saw dust for cooking should be minimized to reduce exposure to carbon monoxide and smoke because of the health implications and also to reduce deforestation.

Keywords: energy, cooking, consumption, community, household

Introduction

Background of the Study

Energy is the prime mover of any economy, and the engine of growth around which all sectors of the economy revolve (Jesuleye, 1991). Energy sources can be classified into renewable and non-renewable forms. Renewable forms of energy include wood, solar energy, biogas and crop residue while nonrenewable forms are mainly petroleum products such as kerosene, petrol, Liquefied Natural Gas (LNG) and coal (Ajani, 1996). Energy is a basic requirement in human life but most of the people in rural areas do not have enough access to it. Since efficient and affordable energy sources are rarely available, they depend on traditional fuels such as wood and crop residues. The technologies used are mostly primitive and inefficient, and barely allow for the fulfillment of basic human needs. Energy serves as input to the production of goods and services in the nation's industrial, transport, agricultural, health and educational sectors, and inefficient supply restricts socioeconomic growth and adversely affects the quality of life.

World Bank (1993) linked Nigeria's energy crises to some inadequacies in supply, distribution, pricing, planning and manpower. Household energy demands that are not meant to have some adverse effects on the living standards of the population with grossly degenerated income and energy poverty. The situation is more pathetic when one realizes the magnitude of nonrenewable energy resources that the nation is naturally endowed with (Iwayemi, 2008). The mechanism for commodity price transmission is very strong when energy products are affected. This is due to the weaknesses and inefficiency of existing transportation systems. Therefore, energy price increase or its acute shortages portend serious welfare losses to households because of reduction in their income and purchasing power. Although Nigerian rural households rely more on biomass fuels than their urban counterparts, they are not completely shielded from adverse economic impacts of energy pricing policies.

Globally, over 2 billion people depend on firewood for cooking but 1.5 million of these have daily difficulty in finding sufficient supply. Increase in population has put pressures on the use of firewood to the point where its collection is destructive and unsustainable (Bob, 1996). Nigeria's economy has, for over two decades now, been plagued by perennial energy crises which manifest in at least four ways: erratic electric power supply, acute shortages of petroleum products on several occasions, sharp increase in prices of energy commodities and frequent conflict between the populace, led by the labour movement, and the federal government on what should constitute appropriate prices of petroleum and other energy-supplying commodities. These lingering crises have dealt several devastating blows on the nation's fragile economy which therefore slows down socioeconomic growth in Nigeria, especially in the rural areas.

Statement of the Problem

Energy consumption is increasing sharply in Nigeria's rural areas owing to increasing human population and better living standard with negative impact on the environment. The pattern of energy supply and usage in Nigeria is such that the choice of energy mix is very important in this energy scenario which indicates that more intensive exploitation of our energy resources is required if we must cope with future demand. Hence, this study seeks to identify the energy consumption patterns of three communities in Akinyele local government of Oyo state, Nigeria.

Objectives of the Study

This research work is a survey of the cooking energy consumption patterns in three communities namely Moniya, Alabata and Odundun in Akinyele local government area of Oyo state. The specific objectives are:

1. To identify the major energy sources used by households in the selected areas.
2. To determine the level of consumption of the energy sources.
3. To determine energy consumption pattern for each household in the areas.

4. To analyze the effects of income, household population, price of each energy source, availability and accessibility on the type of energy consumed by each household.

Significance of the Study

The findings of this research will enable the government to plan for appropriate energy supply (renewable and nonrenewable) to the selected areas to improve accessibility and price control.

Materials and Methods

The survey was carried out in Moniya (latitude 7.5° N, longitude 3.9° E), Alabata (latitude 7.6° N, longitude 3.9° E) and Odundun (latitude 7.6° N, longitude 3.9° E) in Akinyele local government area of Oyo state. Two hundred (200) households were sampled in each community.

Sampling Procedure

Well-structured questionnaires were used to access household energy consumption patterns by gathering data on the name of household head, number of people in the household, type(s) of energy sources used (such as electricity, kerosene, wood, charcoal, saw dust and gas), cost of energy source per month, availability of energy source, accessibility and reliability of supply of energy source, income level of household with respect to energy source, source of energy supply and problems encountered with the energy sources.

Method of Data Analysis

The data obtained were analyzed to obtain the following characteristics:

1. Percentage usage of each energy source in each area.
2. Average cost for each energy source per month per household in each area.
3. Average number of hours in which the supply of the energy source is available.
4. Average percentage of income groups of the households surveyed in each area.

Method of Data Presentation

The results obtained from analysis of the data were presented in tables while bar charts were used to graphically show the relationships between the patterns of the three areas surveyed.

Results and Discussion

Percentage Usage of Each Energy Source

The percentage usage of each energy source is the ratio of the number of households that used the energy source to the total number of households surveyed in the area, expressed as a percentage. That is,

$$\text{Percentage usage} = \frac{\text{Number of households that used the energy source}}{\text{Number of households surveyed in the area}}$$

The results are presented in the following table:

Table 1: Percentage usage of each energy source in the three areas

Energy Source	Town		
	Alabata (%)	Odundun (%)	Moniya (%)
Kerosene	96.5	73.0	100.0
Gas	3.0	0.0	10.0
Electricity	96.5	73.0	100.0
Wood	51.0	61.0	40.5
Charcoal	24.5	18.0	20.0
Saw dust	3.0	0.0	2.5

The percentage usages of each energy source for the three areas are illustrated in the fig. 1.1 below:

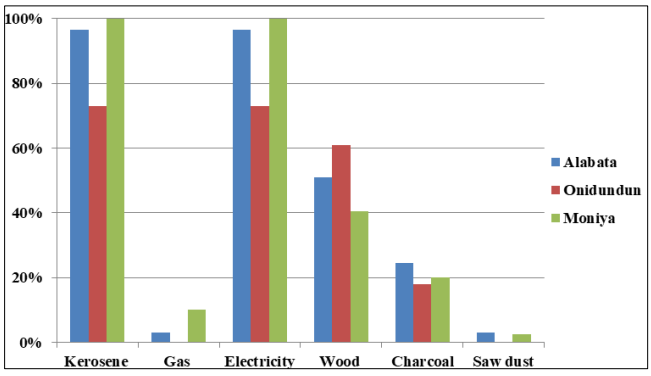

Fig 1: Percentage usage of each energy source in the three areas

From the chart, it can be deduced that Moniya has the highest percentage usage of kerosene, followed by Alabata while Odundun has the lowest percentage usage. Moniya also has the highest percentage usage of gas followed by Alabata, while no household used gas in Odundun. The percentage usage of electricity is similar to that of kerosene in the three areas. The percentage usage of wood is highest in Odundun, followed by Alabata and then Moniya. The percentage usage of charcoal is highest in Alabata, followed by Moniya and Odundun. The percentage usage of saw dust in Alabata is slightly higher than that of Moniya but no household used it in Odundun.

It can also be seen that kerosene and electricity have the greatest percentage usage compared to the other energy sources while saw dust has the lowest.

Average Energy Cost per Month for Each Source

This is the ratio of the total cost of a particular energy source in an area to the number of households that used it in that area, that is,

$$\text{Average energy cost per source} = \frac{\text{Total cost of Energy Source}}{\text{Number of households that used it}}$$

The results are presented in the table below:

Table 2: Average energy cost per month for each source

Energy Source	Town		
	Alabata (₦)	Odundun (₦)	Moniya (₦)
Kerosene	2488.64	2573.51	3001.50
Gas	3666.67	0.00	3950.00
Electricity	1276.97	928.77	1064.35
Wood	1632.94	1711.48	2276.50
Charcoal	1191.43	497.22	423.75
Saw dust	625.00	0.00	520.00

The average energy costs per month for each energy source for the three areas are illustrated in the fig. 1.2 below:

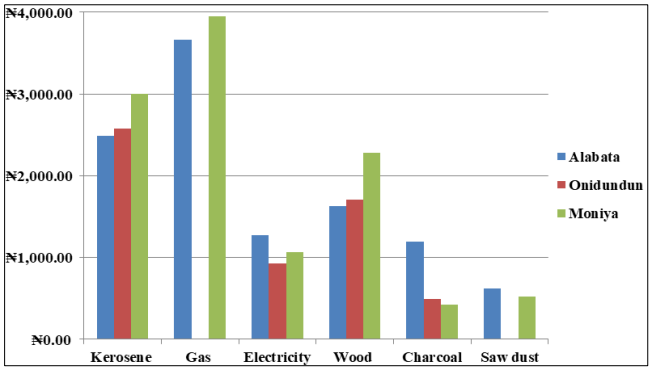

Fig 2: Average energy cost per month

From the chart, it can be seen that the households in Moniya spent the highest amount of money on kerosene compared to the other areas, while Odundun spent slightly more than Alabata. Moniya also spent the most on gas and wood compared to the other areas. Alabata spent the highest amount on electricity, charcoal and saw dust compared to the other areas. Odundun spent the least amount on electricity, Alabata spent the least amount on wood and Moniya spent the least amount of money on charcoal. Households in Odundun did not use gas and saw dust but recorded the highest cost on kerosene and the lowest on charcoal.
The average cost of gas is highest while that of saw dust is lowest for the areas that used them.

Average Period of Supply of Each Energy Source per Day
This is the ratio of the sum of hours available for each energy source in a particular area to the number of households that used it in that area, that is,

$$\text{Average periodof energy supply} = \frac{\text{Sum of hours per source available in an area}}{\text{Number of households that used it in that area}}$$

The results are presented in the following table:

Table 3: Average period of energy supply

Energy Source	Town		
	Alabata (hours)	Odundun (hours)	Moniya (hours)
Kerosene	24.0	24.0	24.0
Gas	13.0	0.0	13.0
Electricity	4.5	3.5	3.0
Wood	24.0	24.0	24.0
Charcoal	24.0	24.0	24.0
Saw dust	24.0	0.0	24.0

The average periods of energy supply per source for the three areas are presented in the fig.1.3 below:

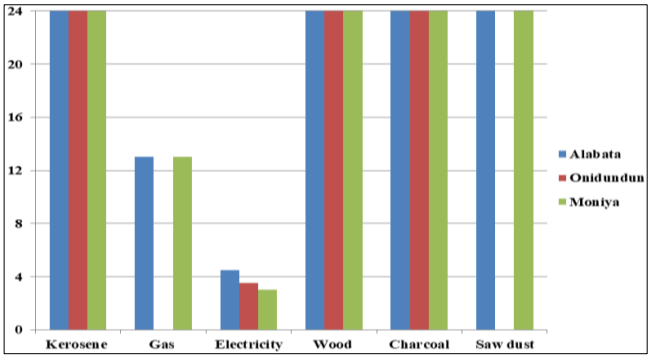

Fig 3: Average period of energy supply (hours)

The chart above shows that there was constant supply of kerosene, wood, charcoal and saw dust. The supply of electricity is the poorest compared to the other energy sources while that of gas is slightly above average. However, the households in Alabata received the highest supply of electricity while those in Moniya had the least.

Percentage of Income Groups per Consumption of Useful Energy
This is the percentage ratio of the number of households in a particular income group to the total number of households surveyed in an area.

$$\text{Pecentage of income group} = \frac{\text{Number of households in an income group}}{\text{Total number of households surveyed in the area}}$$

The results are presented in the following table:

Table 4: Percentage of income groups in the areas

Income Group	Town		
	Alabata (%)	Odundun (%)	Moniya (%)
Low	49.5	44.0	64.5
Lower middle	37.0	29.5	19.0
Upper middle	12.0	22.0	15.0
High	1.5	4.5	1.5

The results of percentage income groups are presented in the fig.1.4 below:

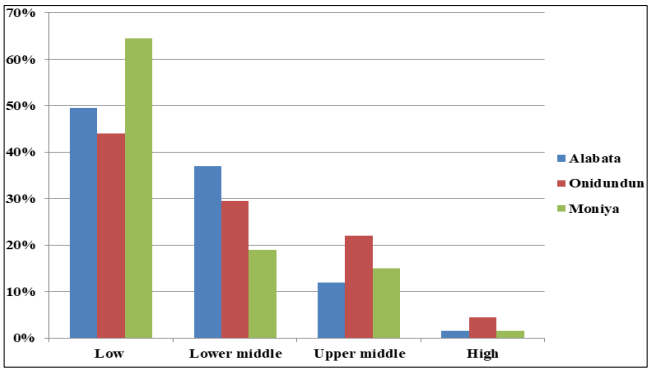

Fig 4: Percentage of income groups in the areas

The chart shows that majority of the households in the three areas belong to the low income group. It can be seen that Moniya has the highest percentage of low income households followed by Alabata. However, Moniya has a lower percentage of lower-middle income households (the lowest of the three areas surveyed) and a higher percentage of upper-middle income households than Alabata.

Odundun appears to have the most of the richest households in the three areas surveyed (that is, the lowest percentage of low-income earners and the highest percentage of upper middle- and high-income earners).

Conclusion and recommendations

Conclusion

The cooking energy consumption patterns in Moniya, Alabata and Odundun communities in Akinyele local government area of Oyo state were studied. Data was obtained from two hundred (200) households in each community using well-structured questionnaires. This was then analyzed to get the energy sources used, the percentage usage of each energy source, the average cost of each energy source per month for each community, the availability (in hours) of each energy source per day and the proportions of the various income groups in each community.

The following may be concluded from the research findings:

1. Kerosene and electricity are the most used energy sources for cooking in the three communities.
2. The average cost per month of gas is the highest while that of saw dust is the lowest in Alabata and Moniya). Households in Odundun do not use gas and saw dust but they spend the highest amount on kerosene and the lowest on charcoal.
3. The daily supply of kerosene and wood in the three communities is constant while that of electricity is the most unreliable.
4. Odundun has the highest percentage of upper middle and high income groups, and the lowest percentage of the low income group. This makes it the richest of the three communities surveyed.

Recommendations

The following recommendations have been provided to address the challenges that currently exist in the use of the energy sources available:

1. The use of wood, charcoal and saw dust for cooking should be minimized to reduce exposure to carbon monoxide and smoke which can cause health problems. These sources also lead to deforestation and excessive release of carbon dioxide into the atmosphere. The households should be enlightened on the potential health hazards of these energy sources and encouraged to concentrate on the use of other cleaner and better sources.
2. There should be adequate investment by the government and private investors to develop a more effective supply system that would increase the availability of gas which is a cleaner source of cooking energy.
3. The government should take necessary steps towards improving the supply of electricity. This will have a direct impact on the standard of living since energy is the driving force behind industrialization and economic prosperity.

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